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ELECTROPHORESIS OF ANTIBIOTICS

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The method of introducing medicinal substances into the organism by means of a direct current (electrophoresis) has been known for a long time. The substances to be introduced into the organism accumulate in the skin, and after penetrating from there into the lymphatic and blood streams, are slowly eliminated from the organism. The skin receptors, in this process, undergo a direct irritation, as a result of which complex reflex reactions take place. These reactions vary depending on the quality of the irritant and the state of the organism.

The ideas of I. P. Pavlov on the action of medicines as reflexogenic irritants played an important role in solution of problems on the effect of electrophoresis of medicinal substances.

The experimental department of the Central Scientific Research Institute for Physical Therapy Methods at Yalta (director, Docent O. V. Grebova) worked out the problem of electrophoresis of penicillin.

This work is being carried out by us together with associates of the experimental and clinical departments of the institute, S. I. Volkhonskiy, A. I. Sorkin, O. G. Mats'ko, and others. The investigations showed that antibiotics carry an electric charge and can migrate under the effect of a direct current, penicillin towards the anode, and streptomycin towards the cathode.

In the electrophoresis of penicillin from the negative pole, and in electrophoresis of streptomycin from the positive pole, the antibiotics are detected in the blood and in the urine. In the usual method of electrophoresis, the accumulation of H and OH ions in solutions of antibiotics lowers their activity. For that reason, specially designed non-polarizing electrodes were used.

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However, since these electrodes are not yet in wide use, a simplified method for the electrophoresis of penicillin can be recommended.

Filter paper or two to three layers of gauze with a surface of 150 to 250 sq cm are moistened with a penicillin solution containing 10,000 to 20,000 international units per 8 to 10 ml distilled water, and applied to the skin, previously washed and moistened with distilled water. A hydrophilic fabric pad of the same size and approximately 1.5 to 2 cm thickness is placed on top of this surface. A semipermeable membrane made of animal matter, moistened with glycerol, is placed between the layers of the pad, closer to the outer surface. This membrane serves as a buffer substance which binds electrolysis products. A metal plate, connected by a wire to the cathode of the galvanic plate, is placed on the outer surface of the hydrophilic pad. The second electrode, the anode, conforms to the customary type, but with a lining of the same thickness as that on the cathode. The current is strong, 20-30 ma. The procedure is carried out once daily, and lasts 20 to 30 min. The course of treatment consists of ten to 20 such applications.

The above method can also be used for the electrophoresis of streptomycin, which is introduced from the anode. For this purpose a calcium chloride preparation of streptomycin must be used.

The electrophoresis of penicillin does not produce any ill effects whatsoever in the patient. Only a more intense and protracted reddening of the skin than occurs in ordinary electrolysis is observed. In about 50% of the patients, an increased skin reaction was observed after five to seven treatments and within 2 to 3 days, inflammations appeared at the area of the location of the cathode. The dermatitis are distinguished by small or large nodes. To prevent dermatitis, it is necessary to change the location of the electrodes and the current density.

Experimental and clinical observations indicated the possibility of introducing penicillin into the tissue of the middle ear by means of a galvanic current applied through the external ear passage. It was also established that electrophoresis of penicillin in many cases contributes to the reduction of inflammations appearing in cases of infectious radiculitis and neuritis, infectious meningomyelitis, suppurative blepharitis, and conjunctivitis.

The favorable effect of electrophoresis of penicillin was noted on a number of patients whose treatment by other medical and physical means had not proved sufficiently effective. The effectiveness of this method was studied at the polyclinic department of the institute in the treatment of furunculosis, hydroadenitis, Morvan's disease, and other surgical diseases.

Upon combination of electrophoresis of penicillin with climatic and physiotherapeutic methods, such as air and sun therapy, UFF, sea bathing, and others, improvement is achieved quicker than in cases where penicillin electrophoresis is used alone.

The experimental observations carried out by us together with the associates from the Yalta Institute of Tuberculosis Climatotherapy showed that in intraperitoneal infection of guinea pigs with tuberculosis bacteria, the life span of the animals treated with streptomycin electrophoresis was longer than that of the control animals.

These observations served as the basis for the further investigation of the effectiveness of streptomycin electrophoresis for the cure of tuberculosis in several sanatoria on the southern shore of the Crimea.

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